HIGH RESOLUTION SPECTROSCOPIC OBSERVATION OF COMET 17P/HOLMES

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Introduction: The comet 17P/Holmes had a spectacular ouburst on October 25, 2007. The magnitude of the comet increased in few hours from 17 to almost 3. The event is extraordinary and unprecedented even for a comet that in the past has been already subjected to this phenomenon. It is known since long time that outbursts are a quite common phenomena in comets, but their physical causes are still uncertain and are matter of debate.

Observations: The comet was observed at the Telescopio Nazionale Galileo, in La Palma, with the cross-dispersed echelle spectrograph SARG. The comet was observed on December 2, when the comet was beginning to fade. At the moment of observation, the comet had a heliocentric distance of 2.4 AU. Two spectra have been acquired, one in the range 4590 – 7920 Å (blue grism) and one in the range 3600 – 5140 Å (yellow grism). Both spectra have a resolution of R=29000. The data have been reduced using the ECHELLE package of IRAF. Incandescent lamp observations have been used to determine the flat field and ThAr lamp spectra for calculating the dispersion curve. By fitting the Thorium line positions for each order, a dispersion solution has been achieved with rms errors lower than 7 mÅ.

Data Analysis: Cometary spectra in the visible range contains a large number of emission lines, as observed for comets like de Vico, Ikeya-Zhang, Tempel 1 [1], [2], [3]. From a preliminary analysis of the comet Holmes spectra, a number of emission lines is visible, to be attributed mostly to C2 and NH2. We are now listing and identifying all the lines present in the acquired spectra.

Three atomic oxygen lines can be found in this range, all representing a phenomenon of prompt emission. They can be produced by many reactions that can involve water, CO and CO2.

In one of our spectra these lines are visible and can be separated from the stronger telluric component. The analysis of these lines is interesting, because it can give a hint on the species that is the main responsible for their origin. We are presenting here a preliminary analysis of these spectra and our first results.

Discussion: Coma spectroscopy is one of the few tools that can be used to infer the composition of the nucleus. The visible spectral range is crowded with emission lines, and between them many lines of daughter molecules and ions are still to be identified. Even new species could be hidden in this forest of lines, but high resolution is necessary to study this kind of spectra, and only in the last years the availability of high resolution spectrographs has been increasing. The study of these lines could provide a large amount of information on the composition and the chemical processes working in the coma, on the environment of molecular formation or condensation and of the thermal history of cometary ices.

The extraordinary event of comet Holmes can give us new hints on the physical processes that acts on these primordial bodies.

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